Module Descriptor

Title	Aircraft Design And Performance		
Session	2025/26	**Status**	Published
Code	ENGG09027	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	B Rakhshani		

Summary of Module

This module intends to introduce students to the broad but specific overview of the aircraft design and performance configurations and its aerodynamic characteristics. In particular the configuration and sizing of wing design in terms of aerodynamic design requirements is studied and aspects of its geometric shape and features are studied and analysed. The effect of aircraft (wing) design features on aerodynamic forces are studied with computing and analysing critical design and performance parameters. Aircraft weight and balance characteristics and techniques to estimate weight and CG position are discussed and students are taught on how to conduct weight and CG analysis. Aircraft stability and control performance characteristics are studied where analytical techniques are used to assess and evaluate the state of an aircraft stability mode. Aircraft performance characteristics in terms of equations of motions, flight mission, flight envelope, and flight phases are studied, and fundamental parameters in flight phase configuration are examined. Limited optimization study to determine and analyse efficient design and/or performance configuration is given throughout the last LO. Also, students will be introduced to the aspects of aircraft sustainable and green design, such as; low energy consumption and green energy, low emissions, green materials (smart, light weight, recyclability), etc. During the course of this module students will develop their UWS Graduate Attributes (https://www.uws.ac.uk/current- students/your-graduate-attributes/); Universal: academic attributes (critical thinking and analytical & inquiring mind). Work-Ready: academic attributes (knowledge of aircraft design and performance and relevant ICT skills, problem solving). Successful: academic attribute (autonomous); personal attribute (resilient); professional attribute (driven). This module has been reviewed and updated, taking cognisance of the University's Curriculum Framework principles. Examples of this are found within the module such as active and engaging laboratory and tutorial activity, module assessment which reflects industry design activities, learning synergies across modules and levels of study, recorded lecture content supporting students to organise their own study time and the use of real-world aircraft design specifications utilising digital solutions supporting assessment authenticity and development of digital intelligence meta-skills.

Module Delivery Method	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Analyse aircraft wing design configuration and the impact they have on aerodynamic forces.
L2	Analyse and estimate aircraft weight and balance and CG position.
L3	Appraise aircraft performance throughout the operational envelope.
L4	Examine aircraft design and performance configuration layout and optimisation.
L5	N/A

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	**During completion of this module, there will be an opportunity to achieve core skills in:**
Knowledge and Understanding (K and U)	**SCQF 9** A critical knowledge and understanding of aerodynamics and aircraft performance and its importance in aircraft design. Specific and detailed knowledge and understanding of the application, techniques and practices associated with aerodynamics and aircraft performance. Using aerodynamics calculation tools to solve engineering and design problems.
Practice: Applied Knowledge and Understanding	**SCQF 9** Applying knowledge and understanding to analyse aerodynamic and aircraft performance problems. Performing wind tunnel testing on aerofoil sections to establish how aircraft wings behave during a typical flight phase. Assessing a wide range of aircraft configurations and deciphering reasons for designing aircraft in this manner from an

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

	aerodynamics perspective. Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed Select and critically evaluate technical literature and other sources of information to solve complex problems. Apply an integrated or systems approach to the solution of complex problems. In relation to aircraft design and performance evaluate the environmental and societal impact of solutions to complex problems (to include the entire life-cycle of a product or process) and minimise adverse impacts.
Generic Cognitive skills	**SCQF 9** Undertaking, evaluating and assessing analysis of aerodynamics problems. Making judgements on analytical data and results. Being able to develop conceptual solutions and strategies to solve problems. Detailing results data and making critical comparative assessments between theoretical and experimental predictions Bringing information together from a variety of sources during problem solving and being able to explain potential problems with methods and strategies.
Communication, ICT and Numeracy Skills	**SCQF 9** Ability to perform, interpret and evaluate complex numerical, geometrical and graphical data and using it to solve problems associated with aerodynamics and aircraft performance. Ability to derive and solve complex equations. Making use of research literature to find solutions to problems and make use of experimental techniques. Using communications skills to write detailed, critical technical reports, including text and illustration.
Autonomy, Accountability and Working with Others	**SCQF 9** Identifying and addressing their own learning needs both during and out with class time. Identifying solution routes and strategies using their own initiative and informed judgments.

Prerequisites	**Module Code**	**Module Title**
	Other	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours. The learning and teaching for this module comprises a series of lectures and tutorials.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	12
Tutorial / Synchronous Support Activity	24
Laboratory / Practical Demonstration / Workshop	6

Independent Study	158
n/a	0
n/a	0
TOTAL	200

Indicative Resources

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

1) Anderson, J. D. (1999) Aircraft Performance & Design. Singapore: WCB/McGraw-Hill.

2) Barnard, R. H. and D.R Philpott (2004) Aircraft Flight. Prentice-Hall.

3) Houghton, E. L., Carpenter, P. W. (2017) Aerodynamics for engineering students, 7th Ed., Elsevier Science.

4) Corke, T. C. (2003) Design of Aircraft. Prentice Hall. Upper Saddel River, NJ: Pearson Education, Inc.

5) Filippone, A. (2006) Flight Performance of Fixed and Rotary Wing Aircraft. Oxford: Elsevier Butterworth-Heinemann.

6) Anderson, J. D. (2016) Fundamentals of Aerodynamics. 6th Edition. New York: McGraw-Hill.

(N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. Students will scan their attendance, via the attendance scanners, each time they are on-campus, they will have their attendance recorded in class and they will be expected to login to the VLE several times per week. Students who are unable to attend a timetabled session, due to illness or other circumstance, should notify their Programme Leader. Across the School an 80% attendance threshold is set. Students who fall below this, will be referred to the Student Success Team to see how they can be best supported in their studies.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code.

Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has laboratory-based teaching and as

such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	CEPS
Moderator	N Kamaruddin
External Examiner	E Tingas
Accreditation Details	This module is part of the IMechE accredited programmes BEng/Meng (Hons) Aircraft Engineering.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.17

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen Closed Book Class Test (30%)
Assessment 2
Design Coursework (70%)
Assessment 3
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book Class Test	☒	☒	☒	☒	☐	30	2

Component 2

Assessment Type	LO1	LO2	LO3	LO4	LO5	Weighting of Assessment Element (%)	Timetabled Contact Hours
Design Coursework	☒	☒	☒	☒	☐	70	0

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	hours

Change Control

What	When	Who
Module Descriptor copied to 2025/26template, LO verbs and resources list updated to reflect ILR feedback, Attendance andEngagement and EDI statements updated	March 2025	B Rakhshani